



(12) **EUROPEAN PATENT APPLICATION**

(88) Date of publication A3:
28.04.2004 Bulletin 2004/18

(51) Int Cl.7: **H04L 1/06, H04L 25/03**

(43) Date of publication A2:
21.04.2004 Bulletin 2004/17

(21) Application number: **03256291.0**

(22) Date of filing: **06.10.2003**

(84) Designated Contracting States:
AT BE BG CH CY CZ DE DK EE ES FI FR GB GR
HU IE IT LI LU MC NL PT RO SE SI SK TR
 Designated Extension States:
AL LT LV MK

(72) Inventor: **Yee, Mong Suan**
Toshiba Research Europe Ltd.
Bristol BS1 4ND (GB)

(30) Priority: **15.10.2002 GB 0223973**

(74) Representative: **Midgley, Jonathan Lee**
Marks & Clerk
57-60 Lincoln's Inn Fields
GB-London WC2A 3LS (GB)

(71) Applicant: **Kabushiki Kaisha Toshiba**
Tokyo 105-8001 (JP)

(54) **Iterative equalisation**

(57) The invention relates to apparatus, methods and computer program code for equalisation. A soft-in-soft-out (SISO) equaliser for use in a receiver for receiving data from a transmitter configured to transmit data from a plurality of transmit antennas simultaneously is described. The equaliser comprises at least one received signal input for inputting a received signal; a plurality of likelihood value inputs, one for each transmit antenna, for inputting a plurality of decoded signal likelihood values from a SISO decoder; a processor configured to determine from said plurality of signal likelihood values an estimated mean and covariance value for a signal from each of said transmit antennas; an expected

signal determiner coupled to said processor to determine an expected received signal value using said mean values; a subtractor coupled to said received signal input to subtract said expected received signal value from said received signal to provide a compensated signal; a filter coupled to said subtractor to filter said compensated signal to provide a plurality of estimated transmitted signal values, one for each said transmit antenna; a filter coefficient determiner coupled to said processor to determine coefficients of said filter using said covariance values; and an output stage coupled to said filter to output a plurality of transmitted signal likelihood values, one for each said transmit antenna, for input to said SISO decoder.

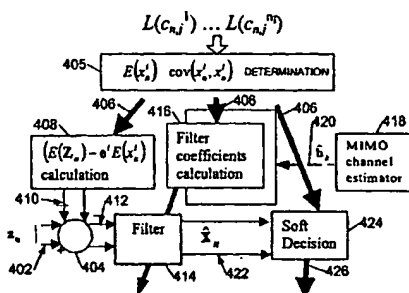


Figure 4



European Patent
Office

EUROPEAN SEARCH REPORT

Application Number
EP 03 25 6291

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int.Cl.7)
D,X	ABE T ET AL: "SPACE-TIME TURBO EQUALIZATION AND SYMBOL DETECTION IN FREQUENCY SELECTIVE MIMO CHANNELS" VTC FALL 2001. IEEE 54TH. VEHICULAR TECHNOLOGY CONFERENCE. PROCEEDINGS. ATLANTIC CITY, NEW JERSEY, OCT. 7 - 11, 2001, IEEE VEHICULAR TECHNOLOGY CONFERENCE, NEW YORK, NY: IEEE, US, vol. 2 OF 4. CONF. 54, 7 October 2001 (2001-10-07), pages 1230-1234, XP001124945 ISBN: 0-7803-7005-8 * section III.B *	11,12, 14,15,27	H04L1/06 H04L25/03
A	---	1-10,13, 16-26, 28-38	
A	BAUCH G ET AL: "Iterative equalization and decoding with channel shortening filters for space-time coded modulation" VTC 2000-FALL. IEEE VTS 52ND. VEHICULAR TECHNOLOGY CONFERENCE. BOSTON, MA, SEPT. 24 - 28, 2000, IEEE VEHICULAR TECHNOLOGY CONFERENCE, NEW YORK, NY: IEEE, US, vol. 4 OF 6. CONF. 52, 24 September 2000 (2000-09-24), pages 1575-1582, XP002180247 ISBN: 0-7803-6508-9 * sections 5 and 6 *	1-38	
			TECHNICAL FIELDS SEARCHED (Int.Cl.7) H04L
The present search report has been drawn up for all claims			
Place of search THE HAGUE		Date of completion of the search 10 March 2004	Examiner Orozco Roura, C
CATEGORY OF CITED DOCUMENTS X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document		T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document	

EPO FORM 1503 03.02 (P04C01)



European Patent
Office

EUROPEAN SEARCH REPORT

Application Number
EP 03 25 6291

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int.Cl.7)
A	<p>TUCHLER M ET AL: "Iterative correction of ISI via equalization and decoding with priors"</p> <p>IEEE ISIT 2000, SORRENTO, ITALY, JUNE 25-30, 2000,</p> <p>25 June 2000 (2000-06-25), page 100</p> <p>XP010509974</p> <p>IEEE, Piscataway, USA</p> <p>* sections I and II *</p> <p>-----</p>	1-38	
			TECHNICAL FIELDS SEARCHED (Int.Cl.7)
The present search report has been drawn up for all claims			
Place of search		Date of completion of the search	Examiner
THE HAGUE		10 March 2004	Orozco Roura, C
<p>CATEGORY OF CITED DOCUMENTS</p> <p>X : particularly relevant if taken alone</p> <p>Y : particularly relevant if combined with another document of the same category</p> <p>A : technological background</p> <p>O : non-written disclosure</p> <p>P : intermediate document</p> <p>T : theory or principle underlying the invention</p> <p>E : earlier patent document, but published on, or after the filing date</p> <p>D : document cited in the application</p> <p>L : document cited for other reasons</p> <p>S : member of the same patent family, corresponding document</p>			

EPO FORM 1503 03/02 (P04C01)